35/11 June 1970

Soil Conservation

Devoted to the wise use of land and water resources

Watersheds and clean water
Modern topographic maps

Soil Conservation Service, U.S. Department of Agriculture

Cleaning up . . .

We approached this issue of **Soil Conservation** amidst an upwelling of concern about pollution and degradation of the human environment.

What accounting for their efforts can conservation agencies give the young people who joined in "Earth Day" teach-ins across the land?

This month we asked SCS field people to examine how the small watershed program relates to the central issue of environmental quality.

Water quality: From widely separated localities with just as widely dissimilar problems, we get reports of how watershed treatment is being designed to restore water quality.

In Pennsylvania (p. 243), a conservation district is using an RC&D project measure to stabilize strip-mine spoil and stop acid drainage into a stream.

In water-short west Texas (p. 245), a Public Law 566 project is stabilizing streamflow and reducing pollution by sediment and salinity.

And in Ohio (p. 255), the Forest Service joins SCS in helping project sponsors remove sources of pollution from an upstream watershed.

Water yield: And how does watershed treatment affect the **quantity** of water in a stream?

ARS researchers summarizing a long-term study of the Washita River watershed in Oklahoma (p. 247), find the results to be mainly in reduced flood peaks and better sustained flow during dry periods.

Computerized maps: The massive task of watershed planning needed (according to the Conservation Needs Inventory, **Soil Conservation,** December 1969) would be well-nigh impossible without the marvels of the computer age. Two SCS cartographers (p. 251) tell how the behind-the-scenes map and engineering data services are keeping pace with today's technological explosion.

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New life for Scrubgrass Creek . . .

Strip-mine reclamation keeps acid and silt out of stream

By Karl Hellerick
District conservationist, SCS, Franklin, Pa.

"It may take 10 years, but we're going to bring Scrubgrass Creek back to life."

Richard Bell, postmaster at Clintonville, Pa., claims people living in Scrubgrass Creek watershed are determined to restore the stream to the fisherman's paradise it once was. The problem is acid draining from coal-mine operations.

Bell recalls the natural beauty Scrubgrass Creek once offered hunters, fishermen, and nature enthusiasts before bulldozers moved into this part of northwestern Pennsylvania during the early 1950's.

By the time strip mining began to decline a decade later, 2,000 acres of the 26,000-acre watershed had been defaced. Acid draining from exposed raw mineral soil on barren strip mines made 30 miles of the creek lifeless. Farms were abandoned. Fishermen and hunters no longer visited the area. The old swimming hole was gone. Public water and sewage facilities became inadequate.

People in this section of Venango County first learned Scrubgrass Creek was "dead" in 1957. That year the Pennsylvania Fish Commission routinely stocked the stream with trout the night before fishing season opened.

The next morning there were many disappointed fishermen at the water's edge. People living along the stream reported that hundreds of fish had floated downstream on their backs the previous night.

In August 1968, directors of the Venango Soil and Water Conservation District met with people of the watershed in the Clintonville Fire Hall and established a Scrubgrass Creek Watershed Committee.

The new committee, backed by 26 private, civic, and governmental groups, gave top priority to reclaiming strip mines. The first step was to establish plant cover on the raw earth to halt erosion and check the washing of deadly acid from the barren soil. Future plans call for new sewage and water facilities, recreation and a beautification program for the watershed.

The Venango Soil and Water Conservation District took the leadership in the reclamation program. It conducted a survey of strip-mine conditions and compiled a list of landowners in the watershed.

The Soil Conservation Service checked soil conditions and provided other technical information for each site.

The program was approved as a project measure in the Penn-Soil Resource Conservation and Devel-

Reduced acid in the water brings back the good old days to Scrubgrass Creek.

Boy Scouts plant more trees on strip-mine areas every spring.

opment Project, which contributed funds to implement the plan.

The district then held meetings to give landowners recommendations for reclaiming each stripped area. The Agricultural Stabilization and Conservation Service financed 80 percent of the cost of planting. State agencies furnished shrubs and seedlings.

The Colonel Drake Boy Scout Council and the Clintonville Youth Club planted seedlings on the strip-mined areas. Each spring, some 400 Scouts from 20 troops have planted around 100,000 seedlings. Now small trees are beginning to stop the soil from washing into streams. The outstanding work won the Scouts the national USDA Green Seal Award in 1969 and the Amos Hoople Newspaper Award 2 years earlier.

Clintonville Mayor Edna Adkins says the local youth club is keeping close watch over the growing tree plantations. She said a member reported that "one tree is doing well and all I did was to pile rocks around it."

The scrubgrass strip mines presented difficult sites for establishing vegetation. There was little success with some spots of very acid soils, with pH as low as 3.5, until white birch was introduced by the Venango program. Plantings of this species are doing well. Bristly locust is proving successful on both steep slopes and level areas. The survival rate of seedlings for the entire area has been high, with red pine and black locust leading the list.

Although acid in the stream is being reduced, a major problem remains in the form of pockets of acid water trapped on the rugged strip-mine sites. During periods of heavy rainfall, these accumulations overflow into the stream and destroy both plant and animal life that has begun to emerge. The RC&D Project measure provides for an experimental effort to meet this problem.

The plan is to install a lime treatment plant in conjunction with a floodwater-retarding structure. The treatment plant will distribute a lime slurry into the stream converting the acid water to an alkaline solution of pH 8.5 at the point of distribution. This water will flow into the floodwater-retarding structure to create a reservoir of alkaline water to be used in neutralizing stormflow in excess of the normal flow capacity of the lime plant.

Lime treatment plants are already being used by the Department of Mines and Mineral Industries to neutralize acid streams in other sections of the Venango District. SCS is cooperating with the Department in planning this new approach involving stored alkaline water.

When trout return to Scrubgrass Creek, as project sponsors hope they will, Postmaster Bell foresees the area as a major outdoor attraction for urban dwellers. Venango County offers the nearest mountain range to the Cleveland-Youngstown, Ohio, and Erie, Pa., metropolitan areas. ♦

White birch seedlings grow on very acid soil where other trees die.

Valley Creek landowner, Hugo Vogelsang (left), shows SCS district conservationist, Willard Hoffman, the restored creek.

"Our creek is running again . . ."

Watershed project holds stream between flood and drought

By Clyde W. Graham and Dale Allen
State conservationist and information assistant, SCS, Temple, Tex.

What effect does an upstream watershed project have on a downstream water supply?

Increased water yield, improved water quality, and a sharply reduced sediment rate is the answer you get if you ask Charles Clifton, a businessman and civic leader at Ballinger, Tex.

Clifton, who was mayor of this west Texas city when construction started on a watershed project above Lake Ballinger in 1964, said, "Our creek is running again, the useful life of our lake has been tripled, and our water isn't so salty anymore.

"Besides that, upstream flooding has been stopped, and soil conservation measures have helped improve the land, which in turn has helped boost our town's economy."

The work Clifton is talking about is an upstream watershed project partially installed on the 150,000-acre Valley Creek watershed which feeds Lake Ballinger. Some 15 flood-retarding dams have been built, and much of the conservation work needed on farm and ranch land has been applied. Five more dams are to be built as soon as construction funds are available.

Already the project is stabilizing streamflow.

Clifton says, "We used to be always going from flood to drought and back to flood in Valley Creek. A big rain would come along, our lake would catch full, and the rest of the water would run out the spillway. Before long, the creek would be dry and we'd be in another drought.

"But now, the soil conservation work slows the water down, letting more of it soak in and recharge the springs. The runoff water is stopped by the detention dams, which hold it back temporarily. Meantime, our lake has been staying full. The dams release the water slowly, giving us water to use for several additional days after each rain. Water has been running through the lake's spillway for more than a year. And it's coming in faster than we're using it."

But what's this about a dry creek starting to run again?

"Well, I was raised on Valley Creek," Clifton replied. "I can remember wading in the creek as a child in the early 1920's. It was fed by springs and ran clear and cool yearlong. In the early 1930's, it quit running. It would run after every rain, then dry up. But after we started our watershed work in 1964, the creek started flowing again and it's been running continuously for about 4 years."

Four watershed dams were built in 1964, two in 1965, and four in 1966. The creek quit flowing a couple of weeks during a drought in 1966. Then it started again and has been flowing ever since.

Hugo Vogelsang, a life-long resident and landowner on Valley Creek, has also seen the stream go full circle—from a live creek to a dry creek to a living stream. Vogelsang is president of the Valley Creek Water Control District, one of the sponsors of the watershed.

"I've seen the time when we'd have a big flood on the creek, then in 8 to 10 hours it would be back within its banks," Vogelsang said. "In a couple of days, it would be down to a trickle. In another week, it would be bone-dry. But now it's been flowing for 4 years except for that short period in 1966."

When the Valley Creek work plan was prepared in 1961, engineers estimated the lake's sedimentation rate at 95 acre-feet a year. Stepped-up soil conservation work and 20 floodwater-retarding dams were estimated to cut this to 33 acre-feet a year. At the 95 acre-feet rate, the effective life of Lake Ballinger was estimated to be 32 years. With the watershed-protection project, this should be stretched to about 90 years, or tripled.

Clifton also said that there had been times in the past when the lake was so low the water was almost too salty to drink, but it is of top quality now.

"I can remember when the chloride content was almost 500 parts per million," he said. "When the creek started running again, the chloride dropped. Last spring, it was down to 164 parts per million.

"I can tell you something else that shows the difference in the quality of our water. I'm in the air conditioner business and out here in this dry country we use a lot of evaporative coolers. I service several every spring. Before 1964, I would find as much as an inch of dry salt in the bottom of the pans. Now I see very little salt. Five years ago, people had to change their air conditioner pads twice a year; now they last a couple of years."

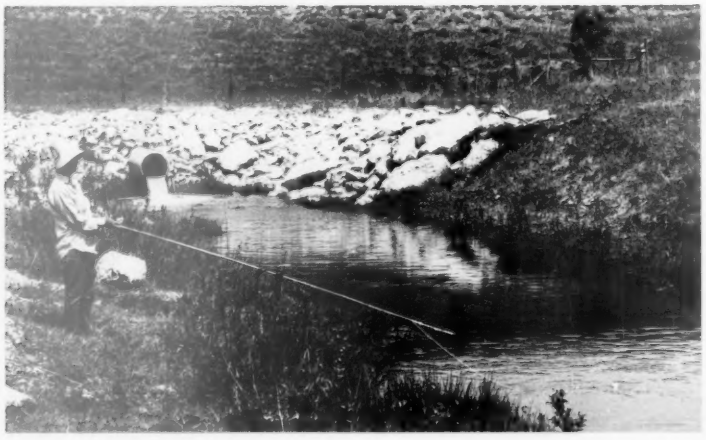
Valley Creek heads 20 miles southeast of Sweetwater and flows through Taylor County into Runnels County, then through Lake Ballinger into the Colorado River. Before 1964, its 11,000-acre flood plain was under water periodically, causing damages averaging about $131,000 annually. When the watershed project is completed, this is expected to be cut by nearly $100,000 a year.

Project sponsors include the Valley Creek Water Control District and three soil and water conservation districts: The Upper Clear Fork, Middle Clear Fork, and Runnels. Three county commissioners' courts—Nolan, Taylor, and Runnels—are also sponsoring the work.

But the watershed job is not yet completed. There are five more dams to build, hundreds of acres of cropland still not getting proper conservation treatment, and grassland improvement work to do.

Even so, Valley Creek is running again. And Lake Ballinger is full of good water. ♦

Water has been flowing through the spillway (left) for more than a year, providing continuous fishing opportunity below the dam.



In the Washita River Project. . .

Effects of watershed treatment on streamflow

By Windell R. Shockey, Monroe A. Hartman, and Dolly R. Hunt
Agricultural research technician, research hydraulic engineer, and administrative officer, Agricultural Research Service, Chickasha, Okla.

Researcher collects sediment sample with hand-held device.

How does upstream flood control affect streamflow in water-short areas?

Such facts become more important each year to farmers, communities, and industries alike.

Finding the answer, by observing the flow of a river through varied land-resource and climatic regions within its basins, poses a complicated research problem.

The problem is further complicated by river water moving underground to the surrounding aquifer, or from the aquifer to the riverbed. This research resembles the problem of a man trying to determine how much water he can carry downhill in a leaky bucket if—

. . . he started with the bucket partly filled;

. . . more water was dumped in at several points en route;

. . . and water occasionally sloshed over the side.

The man needs an accurate measurement of the water he has at the end of the trip. In addition, he must know the total amount of water that was in the bucket at any time during the trip, where it came from, and what happened to it.

Studies on the Washita River basin in Oklahoma and Texas seek to answer the question. The Washita River basin, one of 11 watersheds authorized by the Flood Control Act of 1944 for USDA sponsored watershed protection, is particularly well suited for research of this nature.

The authorized program, consisting primarily of land-treatment measures, such as pasture and range reseeding and improvement, crop rotation, land terracing, stream-channel improvement, and floodwater-retarding reservoirs, initiated in 1946 is now a continuing program by the Soil Conservation Service in cooperation with local landowners and operators.

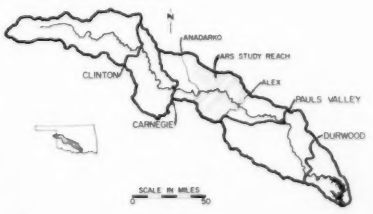
Land use changes and conservation treatment have greatly altered the watershed in 30 years.

In 1930, 55 percent of the drainage area was in poor pasture; in 1960, 76 percent was in pasture, of which 70 percent was classified as "good." By 1965, 800 of the 1,200 planned flood-retarding structures had been built. In addition, Chickasha Lake, Fort Cobb Lake, and Foss Reservoir provide a combined conservation-storage capacity of 364,000 acre-feet.

The Agricultural Research Service started hydrologic research in 1961 on a 1,130-square-mile segment of the Washita River basin, with headquarters at the Southern Great Plains Watershed Research Center in Chickasha, Okla. The Soil Conservation Service, Oklahoma State University, University of Oklahoma Research Institute, Oklahoma Water Resources Board, Environmental Science Services Administration, and other federal, state, and local agencies cooperated in the research.

At the beginning, only nominal

Washita River basin.



Contribution from the Soil and Water Conservation Research Division, Agricultural Research Service, USDA, Chickasha, Okla., in cooperation with the Oklahoma Agricultural Experiment Station, Stillwater, Okla.

Concrete weir measures low flows on a small tributary of the Washita in central Oklahoma.

soil conservation practices had been applied in the study area, thus enabling researchers to record streamflow and channel behavior before and after application of intensive watershed protection and land-treatment measures.

Research planners recognized that watershed-improvement measures could affect more than just the waterflow in the river. Further, the Washita River research would need to yield methods for predicting the flow behavior of other rivers whose basins had been treated similarly. Comprehensive research objectives were adopted, therefore, to include:

(1) Determine how regulated flow resulting from combined land treatment and structural measures in tributary watersheds affect flood flows, annual and seasonal water yields, ground-water levels, stream-channel stability, and sediment movement along the main channel of the river.

(2) Analyze and interpret available data to determine what might have been the effect along the main stem with alternative treatment programs in the tributary watersheds.

(3) Develop hydrologic procedures for making similar estimates in other river basins.

(4) Develop conservation practices for better overall watershed performance.

An extensive hydrologic data-gathering system established in the study area includes: A network of 225 recording rain gages, 30 stream-gaging and sediment-load stations operating continuously, 250 ground-water wells, six reservoir study areas, weather stations, and stations to observe soil moisture accretion and depletion.

Numerous stream channel cross sections and reaches have been surveyed and marked for observation and future reference. Geologic and soil maps have been prepared. Records of land use and locations of applied soil conservation practices are maintained. Records are also kept of water levels in stock ponds, floodwater-retarding structures, and other reservoirs. Results are still incomplete because the studies in the Washita basin are necessarily long-term, but some significant and interesting things have already been found.

For instance, studies in Sugar Creek watershed, a 203-square-mile tributary within the study area, indicated that flood peaks declined by 25 to 70 percent, depending upon storm size and patterns and number of floodwater-retarding reservoirs in operation.

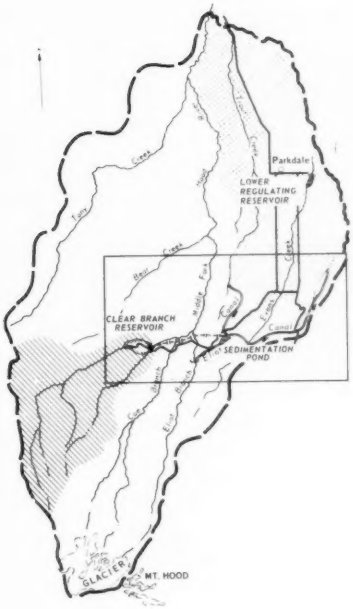
One impressive finding thus far is the large volume of streamflow absorbed by the streambed and adjacent flood plains. About 28,000 acre-feet of water was absorbed in the 80-mile reach of river channel between Anadarko and Alex during the 10-day period in late September 1965. Information about such abstractions of streamflow are basic to an understanding of the downstream effects of treatment measures in upstream tributaries.

Thus, it does not follow automatically that water held on the land to increase crop production or to aid in stabilizing critical sediment-source areas reduces downstream water supplies. Under many climatic and geologic conditions, much of this water would have been absorbed in stream channels and added to ground water or dissipated by evaporation and phreatophytes. Elsewhere, of course, the reverse is true and water infiltrated upstream returns to sustain or increase tributary and riverflow downstream.

Land-treatment and flood-control measures in the Washita River watershed above Durwood, Okla., have reduced the volume of flow occurring at rates above 1,900 cubic feet per second (c.f.s.) and below 300 c.f.s. The volume of flow in the intermediate range (300 to 1,900 c.f.s.) has increased and offsets the reduction to the extent that the total volume of flow remains unaffected by land treatment.

Flow rates below 300 c.f.s. persist for 30 percent of the time for both the treated and untreated conditions of the watershed. Yet, the flow rates for the treated condition are much less during this time than for the untreated condition. Use of water for irrigation and increased use of water by industry probably have been a factor in reducing the flow rates in this 30-percent time period. These uses amount to 30 to 100 c.f.s. daily.

Flood frequency has also decreased at Durwood with change in land use and treatment. During this same period there has been no change in flood frequency on the nearby Kiamichi River where few land use changes have been made. Although large floods still occur after treatment, they occur less frequently. Instead of a 100,000-c.f.s. flood every 20 years, indications are that this size flood will occur only once in more than 100 years. ♦



LEGEND

Watershed Project Boundary

Benefited Area

Proposed Pipe Line

Existing Irrigation Canal

Proposed Multiple Purpose Reservoir

Proposed Regulation Ponds

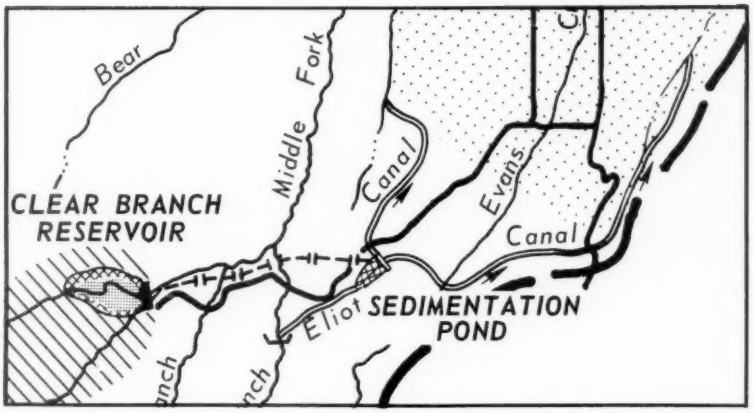
Proposed New Diversion Structure

Drainage Area of Reservoir

PROJECT MAP

MIDDLE FORK OF HOOD RIVER WATERSHED

HOOD RIVER COUNTY, OREGON



On Mt. Hood's northern slope, irrigation water flows down Clear Branch and Eliot Branch, into a sedimentation pond, and down the canals and to the valley orchards. Enlarged portion to right shows details of the primary water-control structures.

Clean water at last! . . .

Watershed project clears glacial debris from irrigation system

By W. H. Coffield
Watershed planning leader, SCS, Portland, Oreg.

Glaciers on the north slope of Oregon's Mt. Hood grind the underlying rock into abrasive "flour" and feed it into icy streams. When rains combine with snowmelt and summer glacier melt the swollen waters sweep tons of sand, gravel, and boulders into irrigation systems with heavy economic cost to farmers in the valley below.

For years—dating from the creation of their Middle Fork Irrigation District in 1917—fruit growers waged a losing battle against dirty water, while producing the famous Hood River apples and pears.

Today, clean water is flowing onto 8,000 acres of farms and orchards in the Upper Hood River Valley, because the newly completed Middle Fork of Hood River Watershed Project provides irrigation storage and control measures to clean or bypass dirty water.

Prior to the watershed project, irrigation water was diverted from Hood River's upper tributaries, less than 3 miles below the north glaciers. These streams were dependable and plentiful year-round, presenting an ideal opportunity for summer irrigation.

Summer, however, brings warm temperatures, rainstorms, flash floods, and accelerated glacial movement. The effect on valley irrigation can be economically crippling. The tumbling streams carry boulders, sediment, and debris to batter control structures and foul the sprinkler irrigation systems.

The main diversion structures fill with debris at least twice a year, usually when irrigation needs are most critical. Coe Branch and Eliot Branch, the principal irrigation sources, were highly susceptible to these glacial outbursts and made economical irrigation in the valley practically impossible.

Even "quiet" glacial streams contain enough sand and silt to frustrate the use of sediment traps along the main canal. The traps must be flushed several times daily, causing interruptions in service, complications in bleeding unwanted air from waterlines, and damage to equipment from overflow sediment despite the best preventive efforts.

Snow-capped Mt. Hood towers over the newly completed Middle Fork Watershed Project, providing water to irrigate Oregon's famous Hood Valley orchards. The sedimentation pond in the foreground removes silt and sand before they can enter the irrigation system.

Highly abrasive under pressure, sediment rapidly scours valves, sprinkler heads, and pipelines, resulting in need for extensive repairs. Sheldon Laurance, former irrigation district chairman, reported that his annual repair cost exceeded $25 an acre. Extended across the district, the damages have exceeded $137,000. Regardless of the exact cost, sediment pollution made it economically impossible for the district to expand beyond its 6,000-acre production base.

In a move to find clean water for irrigation, leaders of the Middle Fork Irrigation District joined with the Hood River Soil and Water Conservation District in filing an application for assistance under Public Law 566 in late 1958. The application was approved, the Soil Conservation Service helped the sponsors prepare a watershed plan, and construction got underway in 1963.

The primary features of the project are a multipurpose reservoir of 2,600 acre-feet capacity on Clear Branch, a diversion dam on Eliot Branch, and a sedimentation pond where waters from both streams are combined. Other measures include: One regulating reservoir, six pipeline intake diversion structures, more than 150,000 feet of distribution pipelines, and more than 4 miles of improved canal.

Water samples tell the story of the Middle Fork Watershed Project. Eliot Branch, left, carries heavy load of glacial debris. Center sample shows same water after settling, as in the sediment pond. Clear Branch, right, runs clean, providing excellent quality water for irrigation.

Though offering excellent water quality, Clear Branch by itself lacked sufficient quantity to meet the irrigation needs. Eliot Branch, a seasonally "dirty" glacial stream, could provide the balance needed, if sediment could be checked.

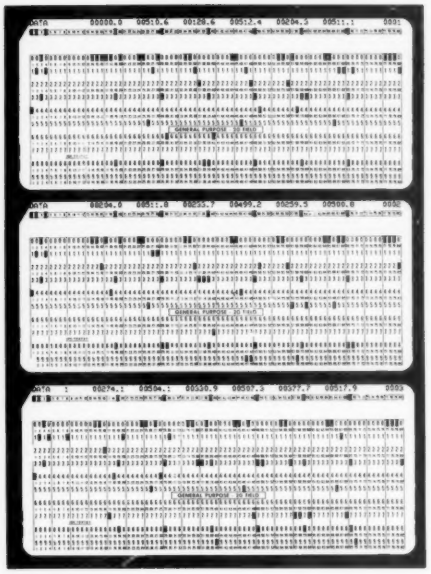
The result is a tandem-like system whereby the Clear Branch Reservoir stores relatively clean, though limited, water year-round. When needed, water is piped to the sedimentation pond, then transferred by canal and pipelines to the farms.

Eliot Branch adds substantially, except during glacial outbursts, when the irrigation district opens the diversion gates to allow the sediment-loaded stream to flow down its normal channel, instead of through the irrigation system. As the outburst subsides, Eliot Branch is again diverted into the sedimentation pond where glacial material can settle out.

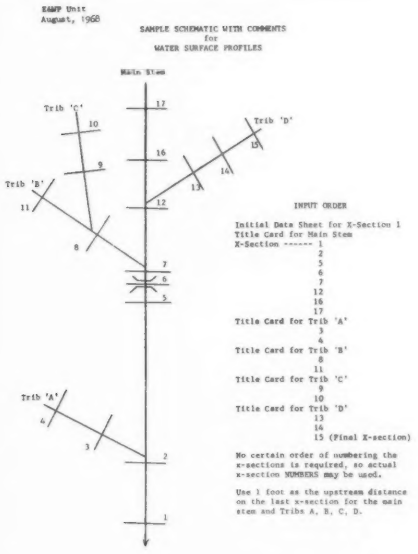
In this flexible combination of storage and control, Clear Branch and Eliot Branch now assure the district plenty of protection to keep equipment in working order and plenty of clean water to irrigate their original 6,000 acres and 2,000 additional acres.

The estimated benefit of the project structures is $272,000 annually, compared to the cost of $90,650—a three-to-one benefit-cost ratio. Public Law 566 funds paid for about 54 percent of the $2.7 million installation costs.

Besides irrigation, Clear Branch Reservoir provides camping, fishing, and other recreation, in addition to fire protection for the Parkdale District. As a secondary benefit, the watershed project is expected to add nearly $300,000 annually in increased area business. ♦



Above, a coordinatograph table is connected to the quantizer which feeds topographic data to the typewriter for printout. At left are examples of punch cards recording cross-section data determined by the stereoplotter and a sample layout of valley cross sections for hydrologic studies.



Maps the modern way

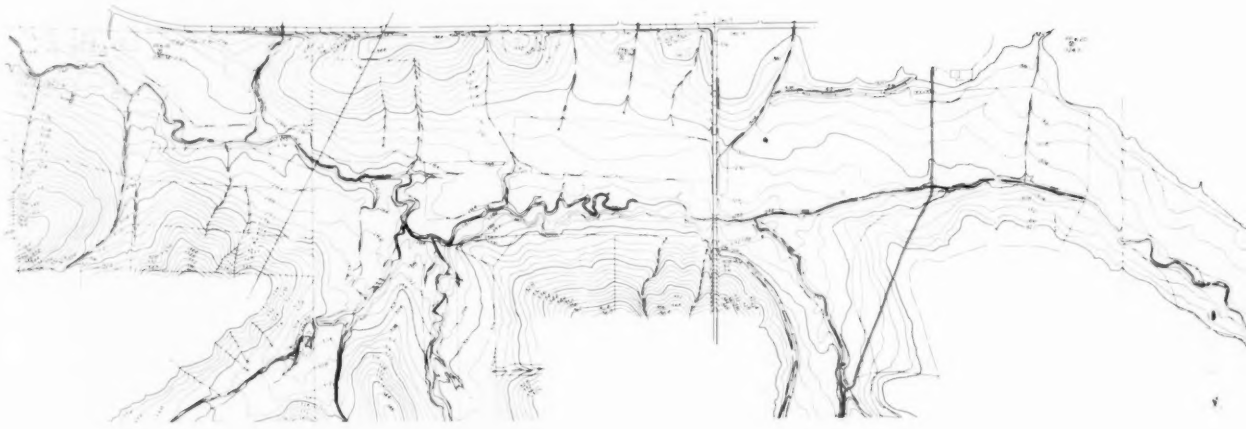
By Jerome A. Gockowski and J. T. Casey
Assistant director, Cartographic Division, SCS, Washington, D.C., and head, Cartographic Unit, SCS, Lincoln, Nebr.

Stereoplotters, computers, and aerial photography are the tools of the Soil Conservation Service's modern map-making service. The combination produces more and better topographic maps, quicker and cheaper, than traditional ground surveys with transit and plane table. Further, it produces related engineering data in a computer-oriented format.

The Soil Conservation Service through its cartographic centers provides a wide range of map, drafting, and reproduction services for field operations in farm and ranch conservation planning, watershed projects, engineering planning and design, soil survey maps, and the like.

Production of topographic maps, which show in detail the contours of the land's surface, has always been an important part of SCS map work. For many years, an increasing portion of this type of mapping has been done by stereoplotting from aerial photographs taken specifically for the requirements of each job. In fiscal 1969, the volume of stereoplotting reached 146,718 acres.

Recently, SCS added Wild B-8 stereoplotters, equipment of advanced design, to the standard complement of Kelsh stereoplotters in



its cartographic units. The result has been increased production while maintaining standards of accuracy.

Most of the topographic mapping done to date has been for the planning and design of floodwater-retarding structures. The maps are used also to provide valley cross sections for calculating runoff at different flood stages, to supply topographic data for irrigation design and layout, and, more recently, for the design and layout of terrace systems.

Detail of topographic work has ranged all the way from maps having 10-foot contour intervals with 5-foot interpolated contours to highly accurate maps having 1-foot contour intervals and showing intermediate spot elevations at high and low points.

Use of stereoplotting equipment to produce topographic data reduces the required time of field people by about 75 percent. Also, the general accuracy of stereoplotted contours is better than that obtained by ground surveys, because this equipment plots contour lines continuously throughout their length.

While ground surveys are highly reliable in the vertical and horizontal location of observed points, the contour lines must be sketched by estimation between these points. The stereoplotters also locate interpolated contours with relation to the ground rather than proportioning them between other contours.

Once the aerial photography has been obtained and the ground control established, the topographic maps can be plotted by machine by day or night, in summer or winter, as needed.

The total cost of obtaining topographic maps by stereoplotting is 40 to 50 percent less than by manual methods. The cost includes aerial photography, ground control, and stereoplotting in the cartographic unit.

This class of work requires advance planning and close coordination between field offices and the cartographic units. Consideration must be given to many interrelated factors in planning each project. Among these are the use to be made of the data; location, size, and priorities of areas to be mapped; contour intervals required and ground work needed; flying season; and costs.

Advances in photogrammetric mapping, including the use of electronic aids, have made it possible to keep pace with SCS's increasing engineering workload without an equivalent increase in manpower. At the same time, they have improved the accuracy of topographic mapping and increased the availability of other forms to topographic data by substituting machine time for manpower.

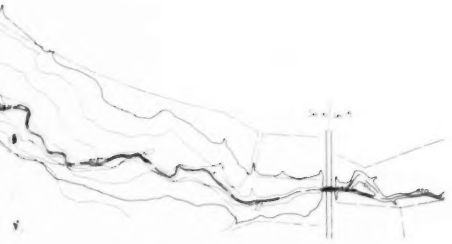
Soil Conservation Service cartographers have been working closely with other agencies and companies that are also developing advanced mapping systems. Equipment has now been adapted to SCS stereoplotters which will calculate data needed by field engineers while plotting topography, thereby releasing engineers for the more highly professional aspects of their duties.

Two of these advanced systems, both involving quantizers manufactured by the H. Dell Foster Company, have been installed, one at the Hyattsville Cartographic Unit in Maryland and the other at the Lincoln Cartographic Unit in Nebraska. The quantizer is interfaced with the stereoplotting machine so that the X, Y, and Z coordinates of every point along a plotted line are recorded as the plotting progresses.

When the field engineer submits a structure site to the cartographic unit for plotting he may not be certain of the structure site location. He may indicate two or three tentative locations.

This combination of equipment enables the cartographer to give the field engineer comparative data on several tentative structure sites as a byproduct of plotting the topography of the watershed. As successive contours are drawn, the quantizer obtains the area within each individual contour at each site and computes the storage volume in acre-feet, or whatever unit of measure is required, within each contour increment.

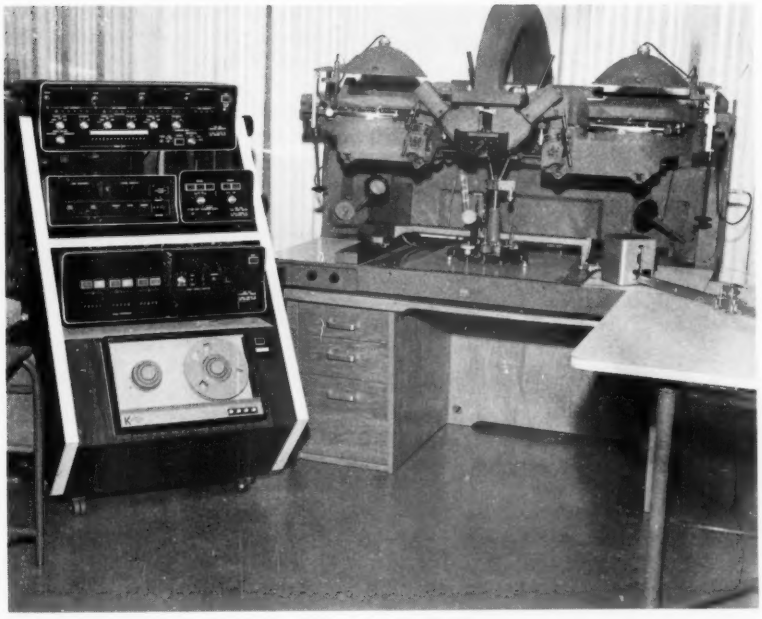
A typewriter attached to the



IOWA-TROUBLESOME CREEK, STR. D-47

ELEV. FEET	AREA ACRES	VOL. ACC. AC/FT
1272	0000 13	
1274	0000 00	0000 28
1276	0000 72	
1278	0000 00	0003 64
1280	0003 64	
1282	0000 00	0017 72
1284	0013 58	
1286	0000 00	0072 04
1288	0028 86	
1290	0000 00	0187 48
1292	0046 31	
1294	0000 00	0372 68
1296	0065 65	
1298	0000 00	0635 32
1300	0088 40	
1302	0000 00	0988 92
1304	0118 37	
1306	0000 00	1462 36
1308	0149 42	
1310	0000 00	2060 04
1312	0184 10	2428 24

A portion of a watershed contour map (left) produced by the stereoplotter and printout (right) of stage-storage data derived from it.



quantizer produces a printout of area and storage volume data in the format used by field engineers. Or, if the digital data are to be used in computers elsewhere, they are recorded on punch cards or magnetic tape.

Valley cross sections can also be obtained by use of the stereoplotter-quantizer-typewriter as a printout at the time of plotting to provide a complete series of cross sections within an evaluation reach of a stream for watershed operations. With water-surface profiles on IBM punch cards, the hydrologist needs only to add the friction factors ("n" values) and other observed variables to derive his complete hydraulic solution by use of computer programs.

Should the volume of fill in structure sites at various elevations be required, the engineer supplies the cartographic unit with the proposed top widths, side slopes, and the crest elevations. The cartographic unit then can provide the volume for any specific elevation or series of elevations. Thus, when the topographic map is returned to the field, it is accompanied by stage-storage data above tentative sites, volume of fill, and valley cross sections.

The cost of this equipment precludes having a complete quantizer attached to every plotting machine. Instead, the system is connected to a coordinatograph table by a switch that makes it possible to time-share the coordinatograph with the Wild or Kelsh stereoplotter. Areas and volumes can be obtained through the quantizer from topographic maps which have been plotted previously in about 25 percent of the time required by procedures in the field. In addition, the data from the coordinatograph table or from the plotter can be stored on magnetic tape or punch cards for future recall in the design of structures, the rating of valley cross sections, and other engineering functions.

This equipment is a basic unit. Additional compatible equipment can be obtained at a later date. This feature makes possible unique performance not available with other existing electronic systems. For example, data can be recorded on magnetic tape that will later drive an automatic drafting machine to produce properly scaled topographic maps as required for field use. In another application, the coordinatograph table can be used to quantize data to digital form from soil survey field sheets and record the information on magnetic tape so it can be used in an IBM 360/65 computer to generate another magnetic tape that will drive an automatic drafting machine producing press-ready negatives of soil maps.

These advancements in topographic map and data production make it possible to provide more cartographic services to the field at less total cost. ◆

Gilbert Run Project nears completion in southern Maryland

By David K. Bowen
Assistant state conservationist, SCS, College Park, Md.

After 15 years of steady progress in watershed planning and flood prevention, southern Marylanders plan to put the finishing touches on the Gilbert Run Watershed Project this year.

Construction on the three water-impoundment structures, located 30 miles south of Washington, D.C., in Charles County, was completed in 1968. Now, local sponsors are commencing a 9-mile channel-improvement project to restore Gilbert Run's original streamflow capacity, long since seriously reduced by sedimentation as a result of two centuries of farming the watershed uplands.

The total effort brings effective flood control, increased recreation, and improved opportunities for further resource conservation to the area.

In 1955, the Charles County Commissioners and the Charles Soil Conservation District applied for assistance under Public Law 566 to help solve a flooding problem in the Gilbert Run watershed. Watershed specialists helped local sponsors draw up a work plan that was approved for operations in 1959, and local residents organized the Gilbert Run Public Watershed Association.

Gilbert Run is a tributary of the Wicomico River, a tidewater stream emptying into the Potomac estuary. Much of the flood plain above the tidal swamps near the stream's mouth have been cultivated from colonial times. Like many other tidewater streams, Gilbert Run was soon choked by sediment carried down from tobacco and corn fields. Stormflows then spread out over the bottom lands, with increasing frequency, forcing many fields to be abandoned and causing a recurring problem on the others.

The original watershed work plan called for three reservoirs to hold back floodwaters and sediment from the uplands plus restoration of the channel to enable it to carry the regulated flow from the floodwater-retarding dams. A supplemental plan in 1965 added recreational water storage and facilities at one impoundment.

Besides the structures, the watershed improvement project includes land-treatment measures consisting of grass seeding, reforestation, pasture improvement, contour farming, and other cropping practices to reduce sedimentation of the reservoirs and new channel.

All of the flood-plain land is in private ownership except road rights-of-way. In addition to protecting the farmland, the project will prevent flooding of the roads and reduce bridge maintenance.

Already, the reservoirs and land treatment are stabilizing the streamflow by holding back floodwater and releasing it during dry periods. The Jameson Reservoir, near the headwaters of the stream, holds about 86 million gallons of water in the pool reserved for sediment storage. During a summer drought in 1966, about 11 million gallons of this water was released in a 23-day period to keep the stream flowing and preserve the fishery. The Trinity Reservoir, located on a lefthand tributary that enters the main stream about half-way down the watershed, contributed another 35 million gallons a day during a 35-day period.

The regulated release of water to sustain fish and wildlife during the drought earned the Gilbert Run Public Watershed Association the 1966 award as "Conservation Organization of the Year" given by the Maryland Wildlife Federation in cooperation with the National Wildlife Federation and the Sears Roebuck Foundation.

Measures to protect wildlife are included in plans and contracts for construction of the final phase of the project. The channel slopes will be seeded during construction and the other disturbed areas soon afterward to reduce sediment damage to

Jameson Reservoir is the uppermost of Gilbert Run's three impoundments.

the stream. A section of the channel toward its lower end will be enlarged to allow settling of sediment before it reaches the Wicomico River. The three existing impoundments are trapping about 90 percent of the eroded material reaching them from the watershed above.

In further interest of fish life, the contract requires that excavation along the lower reach of the stream be discontinued during the anadromous fish run from mid-March to June 1. On recommendation of the Maryland Department of Game and Inland Fish and the Department of Chesapeake Bay Affairs, the sponsors are negotiating with private landowners for modifications in the channel to enhance its use by anadromous fish and to hold water in some of the oxbows of the old channel which the new channel will bypass. ♦

Pollution control, water supply combined in project plan

By Floyd L. Wiles and Jesse L. Hicks
Forester, U.S. Forest Service, Morgantown, W. Va., and assistant state conservationist, SCS, Columbus, Ohio.

The people of three south-central Ohio counties are looking to a small watershed project to solve a problem of severe water pollution caused by erosion and raw sewage.

The 117,800-acre Pine Creek Project under Public Law 566 also provides new hope for the economic future of Jackson, Lawrence, and Scioto counties.

"Plenty of clean water is essential to the future development of this region," says Marion Edmundson, chairman of the board of directors of the Pine Creek Conservancy District. "By using multipurpose reservoirs, we expect to provide the needed water supply and increase recreation facilities while controlling floods."

Some small towns and villages, such as South Webster, Wheelersburg, and Ironton, need a water supply for future growth and expansion. Many of the municipalities in the watershed face water-quality problems. Recreation facilities are inadequate. Wells in the rural areas do not meet the needs.

The plan for the project provides for watershed protection, flood prevention, municipal and irrigation water supply, recreation development, and a land-treatment program. It includes seven single-purpose flood-control structures, two multipurpose reservoirs providing storage for water supply, and two multipurpose reservoirs to be developed for recreation. Land-treatment measures include conservation treatment of 18,255 acres of forest land and 11,505 acres of cropland, grassland, and other land; 25 acres of strip-mined area rehabilitation; and erosion control along 5 miles of road. Construction began in August 1969 shortly after Congress approved the plan.

The structures are planned to reduce the average annual floodwater damages by 71 percent, benefiting 265 farms in the area. Eighteen miles of highway, 6 miles of railroad, 32 houses, and two commercial firms will receive significant protection. Average annual reduction in damage to the total watershed will amount to an estimated $125,000.

Sources of stream pollution identified in formulating the plan included 220 outside toilets, seven trash dumps, and minor acid mine drainage on three tributaries. Many of the outside toilets have already been eliminated by the forest land acquisition program of the U.S. Forest Service. The remaining toilets will either be eliminated by the purchase of land by the Forest Service or will be enjoined from use by the county health board. The seven trash or refuse dumps will be eliminated by the county commissioners, township trustees, and the Forest Service.

Land-treatment measures applied by landowners in cooperation with the soil and water conservation districts will reduce pollution of streams by sediment. Forest land-treatment measures on private land will be installed by the landowners with technical assistance from the Ohio Department of Natural Resources in cooperation with the Forest Service. The Ohio Department of Natural Resources will install land-treatment measures on the Dean State Forest and the Forest Service on the Wayne National Forest. Educational assistance will be provided by the Cooperative Extension Service.

Two reservoirs will be developed for recreation. An area of 860 acres will be developed for public use around one recreation pool of 583 acres. Facilities will include 800 feet of beach with bathhouse, two boat launching ramps, a family campground of 150 sites, and group facilities for 300 people with complete water and sewage systems.

The Forest Service will administer the public recreation area and will supplement it by improvements in wildlife habitat on National Forest land in the watershed.

The $8,414,265 cost of the project will be shared by the Soil Conservation Service in the amount of $3,457,331; the Forest Service, $3,044,152; and local sponsors, $1,912,782.

Appraisal work has started with funds from the Ohio Department of Natural Resources revolving fund in the form of a loan of $55,000. The directors of the conservancy district have filed an application with the Farmers Home Administration for a loan for construction and development of the water-supply portion of the plan. ♦

Conservation in action...

New Mexico rancher shifts wornout farms to grassland

New Mexico

The 300-year-old Spanish ruins of Gran Quivira Mission, south of Mountainair, N. Mex., testify grimly of a civilization destroyed by uncontrollable forces—chiefly drought.

Fifteen miles away, the farming town of Claunch, N. Mex., is fading quietly away, leaving no monuments to compare with Gran Quivara, nor even the subsequent scars caused from cropping nonarable land.

D. H. (Doc) Dean and his wife Charlene own 23 sections of Claunch ranchland. The Deans moved to Claunch in 1942 and began acquiring land in piecemeal fashion. Their ranch eventually contained some 1,300 acres of cropland and even more acreage in wornout farmland.

Under cultivation, the sandy soils could produce good yields, but erratic rainfall and high winds caused many crop failures and severe erosion. Dean bought these fields and seeded them to improved native grasses, out-producing the adjacent range that was never cultivated.

In 1961, Dean developed a conservation-treatment plan for his ranch through the Great Plains Conservation Program. The plan provided for federally cost-shared conversion of all cropland to rangeland and the construction of three livestock ponds, installation of 3 miles of livestock water pipelines, brush control on 845 acres of pinion-juniper range, and building more than 6 miles of cross fences for better distribution of livestock. These treatments required an expenditure in excess of $50,000. Dean also applied several other practices that were not cost-shared.

To illustrate the difficulty in revegetating sandy cropland, Dean points to a 2,000-acre tract that he acquired in 1966. Establishing grass there requires a dead litter cover, so the new owner sowed 1,400 acres to rye but lost half to poor seasonal moisture and lack of topsoil. A year later, the bare half was again drilled to rye, this time under good weather conditions, but grasshoppers and rabbits practically ruined the cover.

Finally, in 1968, blue grama and sideoats grama were drilled in the rye residue, and all but 10 to 15 percent appears to be established. Under normal conditions, it will be 2 or 3 years before normal grazing is permitted. Altogether, the project will require 7 years of expensive, and patient, rehabilitation.

Unlike the builders of Gran Quivira, Rancher Dean has created a living monument to wise land use, and his efforts stand as examples for others to follow.—MORRIS WILLIAMS, *assistant state resource conservationist, SCS, Albuquerque, New Mexico.*

Rancher D. H. Dean (right, above) and SCS conservationist Morris Williams survey a former beanfield that has been restored to native grass. Wind erosion delayed for 2 years the grama-grass planting below.

Remains of old barn on former farmland.

Kentucky

Banker invests time, money in wildlife habitat

In addition to his responsibilities as a member of the local district board and city planning commission, a Prestonburg banker manages one of the finest and largest wildlife habitat developments in the mountains of eastern Kentucky.

H. D. "Buddy" Fitzpatrick, Jr., has set aside approximately 80 of his 650 acres in the Floyd County Soil and Water Conservation District. The rest of the farm is in woodland, pasture, and hayland.

In 1969 Fitzpatrick improved 38 acres of habitat in a small valley below the large timber line. The area included 7 acres of food plots and brush piles left for cover in open areas on bottom land. Five acres was seeded to orchardgrass and

whiteclover mixture for rabbits, quail, grouse, and deer. The vegetation not only provides food but also attracts insects which the animals eat. Fitzpatrick seeded wheat and hairy vetch in other areas and found vetch to be particularly effective cover for smaller animals.

On the mountainside at the edge of heavy timber he cut a 20-foot strip where plant cover will gradually develop through natural succession. The strip allows grouse and deer to feed in open space close to good cover. Brush cleared from the area and stacked along the lower edge of the lane supplements standing cover.

Fitzpatrick has also completed 8,400 feet of stream channel improvement on the Left Fork of Middle Creek and the main branch of the same stream. He has renovated many acres of pasture. Recently, he installed a 5,879-foot underground tile drainage system.

Encouraged by the success of his efforts, Fitzpatrick plans to develop more wildlife areas, improve woodland, and seal several more ponds. —JIMMIE R. CHILDERS, *district conservationist, SCS, Prestonburg, Ky.*

Florida

Thoroughbred conservation on horse farms

Where thoroughbreds thrive on bahiagrass instead of bluegrass, soil conservation practices are being added to normal operations.

Of the nearly 150 horse farms in north central Florida around Ocala, several have already received assistance from SCS and the Marion County Soil and Water Conservation District.

At Dorchester Equine Preparatory School—home of Carry Back —erosion on exercise paths brought owner-operator Jack Price to the district. It was recommended that areas be seeded with bahiagrass, mulched, and not used until the grass had been reestablished. Price plans to train colts for steeplechasing, so the grass had to be particularly tough.

At nearby Tartan Farms, all 600 acres are under a conservation plan. Manager John Hartegan developed a 4-acre pond with district assistance and installed tile drains to cure a damp spot in one of the paddocks. He also put in an underground livestock watering system.

One of the three ponds stocked with bream and bass at Hobeau Farms is a beautiful lake in the infield of the mile training track. With some guidance from the district, Elmer Hubeck manages resources for prize stallion Beau Gar and other horses. SCS gave assistance during the construction of an embankment-type pond at Hobeau Farms. The district was also asked to do the surveys for the development of a lake at Hubeck's own farm, Quail Roost.—HARVEY C. RATHEL, *district conservationist, SCS, Ocala, Fla.*

Arizona

Citrus grower saves water with irrigation system

Among practitioners of good water management, Art Bodine is a leading light. He is his own worst critic, especially concerning what he calls his own short-sightedness.

If he had known in 1944 what he knows now, he says, he would have been using 40 percent less water during the past 25 years on his 1,800 acres of citrus orchards in Deer Valley north of Peoria, Ariz.

In 1944, Bodine became a cooperator with the Agua Fria-New River Soil Conservation District, and SCS conservationists and engineers began assisting him in a land-leveling operation while advocating the feasibility of improved water-management practices.

He now has a conservation irrigation system installed on 500 acres, with runs 660 to 880 feet long having a fall of 0.2 to 0.3 foot in their total length. On this land there is no wasted runoff and he irrigates with 40 percent less water than is required on the remainder of his orchard.—MARVIN SKOUSEN, *soil conservationist, SCS, Phoenix, Ariz.*

Maine

Soil survey prompts successful family garden

A soil survey, a small garden, and a roadside stand have brought new jobs and income to the Bushey family in the little town of Princeton, Maine.

Mrs. Eleanor Bushey, her six children, and their semiretired uncle, Frank Bailey, began to cash in on the promising characteristics of 3 acres of good soil after a survey was done by the Washington County Soil and Water Conservation District.

Training track, infield lake, and island at Hobeau Farm.

Art Bodine's citrus grove under conservation irrigation.

Lake for day campers (left). SCS Soil Scientist William Meade instructs Boy Scouts at Camp Cherokee.

Following a conservation plan prepared for Bailey's 8 acres, the industrious family set 1,000 strawberry plants in the spring of 1968. Slow growth caused by a dry season prompted the construction of a ¼-acre multiple purpose pond later that summer. A borrowed bulldozer and cost-sharing through the Agricultural Conservation Program were used to make the most of a brook that crossed the property.

During the 1969 growing season, a portable pump and garden sprinklers brought ample water from the pond to the strawberries. The children swam and fished in the pond that had been stocked with brook trout. The irrigated fields yielded 2,650 quarts of berries that brought almost $1,770 gross income at the family's roadside stand. Sweet corn, potatoes, gladioli, and tomatoes were also raised and sold by the enterprising youngsters.

In addition, the Busheys planted pinto beans from the surplus food program and stored them for the winter—in effect, making the soil a year-round source of support.—DONALD HARRIS, *district conservationist, SCS, Machias, Maine.*

New York

Lake adds to success of rural day camp

"The lake has been of tremendous interest to the children," said Dr. Jesse Kaye, owner of a day camp near Albany, N.Y.

The 4-acre lake was constructed as part of his conservation and recreation plan as a cooperator with the Albany County Soil and Water Conservation District.

The Kayes had decided that a high dry knoll on their property would provide good play areas for the operation of a day camp. A short diversion ditch to catch seepage and runoff water and feed the pond was constructed. The owners were impressed by the fact that their lake is filled solely by runoff water from their own watershed.

To protect and beautify the area, the Kayes planted trees on several acres of sloping abandoned hayfields. Today there is a fine spruce and pine plantation taking shape.

Last summer 240 children were enrolled in the day camp.

"We feel that the lake definitely aids us in attracting better qualified personnel and more customers," Dr. Kaye comments. "We have been able to expand our water facilities and add canoeing and sailing to our day camp program."—FRANK E. LEAVITT, *district conservationist, SCS, Delmar, N.Y.*

Texas

Boy Scouts learn conservation at camp

"We want it rustic and rugged," said the director of the Circle 10 Boy Scout Reservation, describing a conservation plan developed in August 1966 with the Trinity-Neches Soil and Water Conservation District for Camp Cherokee near Athens, Tex.

Camp Cherokee, which serves large numbers of Scouts from the Dallas-Fort Worth area, is comprised of some 3,500 acres of small farms and former cropland interspersed with beautifully wooded hills and grassed valley. More than 80,000 pine seedlings have been planted on the former fields, and Coastal bermudagrass has been sodded on areas of heavy activity—all by Scouts under supervision of professional conservationists.

The North Central Texas Chapter of the Soil Conservation Society of America (SCSA) selected Camp Cherokee as its 1969 project, providing instruction in resource conservation and development for some 1,500 summer campers.

SCSA members met with Scout sponsors prior to summer camp and set up Scout conservation work on such practices as mulching, bermudagrass sodding, watering, mowing, fertilizing grasses, and constructing miniature dams.

Instructors emphasized proper development of wildlife habitat, removal of undesirable brush and weeds, and care of seedlings. As part of their nature study, Scouts collected, identified, and mounted some 85 native plants.

SCSA instructors, which included area and district conservationists, soil scientists, and forestry and pasture specialists, held half-day sessions with the Scouts once a week for 5 weeks, discussing pollution, wildlife, soil, water, forestry, and other areas of resource conservation.—HUBERT H. MOON, *soil conservationist, SCS, Athens, Tex.*

Unirrigated corners become multiple use recreation area

A Kansas irrigator turns wasteland, not reached by circular sprinklers, into a combined wildlife, recreation, and wind-erosion control area with the help of local people and state and federal agencies.

Roger Ramsey raises irrigated corn on 160 acres near Garden City. A person flying over the area in the summer sees large round green checkers on a gray-green checkerboard. The green circles are areas of lush corn being irrigated with circular sprinkler systems. Since the sprinklers rotate around a central point of a 160-acre square, with the irrigation water falling within the circle, there are about 25 acres left dry in the four corners. Where the soil is sandy and droughty, the corners grow sagebrush and yucca.

But Roger Ramsey is doing something unusual and practical with the dryland.

In 1968 he presented to several agencies his idea of setting out trees and shrubs to create a wildlife, recreation, and wind-control area in this wasteland. The proposal grew into a community cooperative project when the Finney County Parks, Fish, and Game Association generated interest with a dinner that featured a variety of wild game meat and a talk on wildlife and forestry conservation by the local game warden.

Members and sons of the sportsmen's club, Boy Scouts, 4-H Club members, and Ramsey and his sons spent 2 days planting some 4,000 trees and shrubs.

A circular windbreak, made up of a row of Russian olive, two rows of redcedar, and a row of Nanking cherry, will be stocked with quail. Other small game and nongame animals will come naturally into the area as it becomes a favorable wildlife habitat.

To supplement precipitation, the irrigation will provide moisture to the trees in the perimeter. Snow is expected to accumulate against the trees and shrubs, adding further moisture.

Plans are for the sportsmen's club to maintain the wildlife and recreation area and build a clubhouse in one corner. Ramsey plans a fishing reservoir for the opposite corner.

Technical help in planning the project was given by the Soil Conservation Service through the Finney County Soil Conservation District; by the extension forester; and by the Kansas Forestry, Fish, and Game Commission. The Agricultural Conservation and Stabilization Service provided cost-sharing.

Ramsey and the sportsmen look on the project as having many benefits.—ROBERT H. FULLER, *district conservationist, SCS, Garden City, Kans.* ♦

Scout Charles Graber holds a young cedar tree planted as part of a 4-row windbreak around corn grown with a circular irrigation system, while (left to right) Scout Executive Charles A. Pearson, SCS Conservationist Fuller, and Tom Walker, president of Finney County Parks, Fish, and Game Association, look on.

Watershed symposium to be held in August

A symposium on the theme, "Interdisciplinary Aspects of Watershed Management," will be held at Montana State University, Bozeman, August 3-6. It is being sponsored jointly by the American Society of Civil Engineers, American Society of Agricultural Engineers, and Montana State University.

Besides an opening keynote session, plans call for a banquet the first evening plus five half-day programs on the following subjects: Water quantity, water quality, flood and erosion management, vegetative management, and wildlife and recreation management. Additional information may be obtained from Dr. Glen F. Martin, Department of Civil Engineering, Montana State University, Bozeman, Mont. 59715. ♦

Meetings . . .

Water Works body studies environmental health

A theme of international scope, "World and Water Imperatives," awaits participants in the 90th annual conference of the American Water Works Association, Inc., in Washington, D.C., June 21-26.

"Population Explosion," "World-City of the Future," and "Water Supply and Environmental Health" will be the subjects discussed in the general session.

The conference will include 28 sessions. The Resources Division will consider topics on water reuse and regional, national, and overseas programs; the Management Division, among others, the role of the Federal Government in water supply and combined water and wastewater operations.

Watershed Congress assesses program

The 17th National Watershed Congress to be held in Denver, Colo., June 7-10, will present as its theme "Assessing the Watershed Program—1970." Divided into four sessions, the technical program will deal with fish and wildlife, water, land, and the forest assessments.

The feature of the banquet on the final night will be presentation of the 1970 awards for the watershed-of-the-year and honoring the watershed man-of-the-year. A motion picture documentary of Brush Creek Watershed of Mercer County, W. Va., the 1969 Watershed of the Year, will be shown.

Education Conference on the environment

The 34th Annual Educational Conference on the Environment will be conducted by the National Environmental Health Association in Las Vegas, Nev., June 21-26.

A round table and panels will consider such topics as air pollution, housing and urban development, solid waste disposal, and training for environmental control.

Such distinguished ecologists and scientists as Dr. Lamont Cole, professor of Ecology, Cornell University, and Dr. Stanley Cain, chairman, School of Natural Resources, University of Michigan, will speak. Craig Palmer of the United Press International asks, "Is the environmental issue a fad, or bandwagon issue?" in his speech on "Environment and the Press."

Women's Club's target is clean environment

More than 2,000 delegates from every state in the Nation, plus those from clubs in 54 foreign countries will participate in the General Federation of Women's Clubs' 79th annual convention to take place in San Antonio, Tex., June 7-12.

The interest of clubwomen in conservation, which began in 1898 will be furthered at this convention. Of 10 resolutions to be voted on by the delegate body, five are concerned with aspects of this subject; namely, "Use and Control of Chemical Pesticides," "National Forests Jurisdiction," "Water Crisis," "Wilderness," and "Clean Environment."

Resolutions adopted form the policy of the General Federation and serve as the basis for action on projects by member clubs at the community level.

Seed Association meets to discuss changes in laws

Lake Tahoe, Nev., will be the setting for the 8th annual convention of the American Seed Trade Association on June 29 to July 2.

Most of the work will be done in division and committee meetings. The Soil Conservation Service is represented on the Conservation Committee of the Farm Seed Division.

The purposes of the association include participating in the drafting of amendments to the Recommended Uniform State Seed Law; evaluating proposed amendments to the Federal Seed Act, tariffs, and weights and measures laws; developing statistical information to aid USDA; and maintaining close liaison with seed-testing authorities.

Air Pollution body works to implement standards

The 63d. annual meeting of the Air Pollution Control Association will take place in St. Louis, Mo., on June 14-18.

About 150 papers will include the problems of motor vehicle exhaust, surveys of air pollution problems, and solutions that have been adopted by the process industries. Two plenary sessions will be devoted to the implementation of air pollution standards and national emission standards.

Dates and places

June 7-10, National Watershed Congress, Denver, Colo.
7-12, General Federation of Women's Clubs, San Antonio, Tex.
14-18, Air Pollution Control Association, St. Louis, Mo.
15-19, American Water Resources Association, Urbana, Ill.
20-26, Outdoor Writers Association of America, Inc., Coeur d'Alene, Idaho.
21-25, The American Institute of Architects, Boston, Mass.
21-26, American Water Works Association—National Symposium on Hydrobiology, Washington, D.C.
29-July 2, American Seed Trade Association, Lake Tahoe, Nev.
30-July 2, Federal and State Water Officials, Charleston, S.C.

July

1-6, National Education Association, San Francisco, Calif.
8-10, American Society of Agricultural Engineers, Minneapolis, Minn.
8-10, Izaak Walton League of America, Norfolk, Va.
18-22, American Association of Nurserymen, Inc., San Francisco, Calif.
19-23, National Federation of Business and Professional Women's Club, Inc., Honolulu, Hawaii.
26-29, National Association of Counties, Atlanta, Ga.
30-31, Great Plains Agricultural Council, Albuquerque, New Mex. ♦

Review . . .

Urban flood-plain management

Flood Plain Management: Iowa's Experience. EDITED BY MERWIN D. DOUGAL. 1969. *Iowa State University Press, Ames. 270 pp., illus. $6.95.*

This volume brings together some 21 papers given at the sixth annual Water Resources Design Conference at Iowa State University. It provides a comprehensive inventory of the problems and potentials being encountered in flood-plain management.

The 21 papers are authored by state and national leaders in numerous disciplines, such as engineering, hydrology, law, urban planning, private consultants, landscape architecture, researchers, technicians of the water and weather agencies, and others.

Each of the seven chapters covers a specific aspect of the subject and in total they cover many problems associated with the planning and installing of action programs for attaining optimum and wise use of flood plains.

Although the primary emphasis is on the flood-plain management experience in Iowa, some attention is given to other areas, particularly, the Tennessee Valley and Lincoln, Nebr. Most of the techniques of flood-plain management outlined are equally applicable to other areas of the Nation.

The major concern of the book is with the regulation of flood-plain use to prevent additional flood problems, rather than with structural works to prevent or control floods. It does, however, consider structural flood-control measures and their place in a balance program for flood-plain management.

The papers give little attention to flood-plain management in rural areas, where flood losses pose an equally serious problem. These areas should also receive attention in any balanced national program for total flood-plain management.—ERWIN C. FORD, *Watershed Planning Division, SCS, Washington, D.C.*

New publications

A New Life for the Country. *1970. The Report of the President's Task Force on Rural Development (U.S. Government Printing Office). 51 pp. $0.35.* Some of the many topics treated in this report include the need for rural development and for a national policy on the geographic distribution of population and economic growth. The task force emphasized the need for codifying existing statutes and evaluating the present federal programs that apply to rural development. The report encourages closer partnership between local, state, and federal governments and private industry for rural economic and social development. Expanding educational opportunity in rural areas, upgrading housing and health care, and accelerating the development of land and water resources are other major topics.

Conservation Highlights, 1969. *1970. USDA Soil Conservation Service. 6 pp.* This folder presents a digest of the progress report of the many activities of the Soil Conservation Service for the fiscal year 1969. Data are given on outdoor recreation, community services, watershed-protection and flood-prevention projects, conservation districts, the Great Plains Conservation Program, conservation needs inventory, land-treatment progress, Resource Conservation and Development projects, snow and soil surveys, river-basin planning, and international activities.

Surveying Our Public Lands. *1969. U.S. Dept. Int., Bureau of Land Management. 16 pp., illus.* $0.15. Describes geodetic surveys, topographic surveys, and cadastral surveys and tells how surveying of more than 477 million acres of public land in the U.S. is done and the personnel and equipment used to conduct the surveys.

Fact Book of U.S. Agriculture. *Rev. 1970. USDA Misc. Publ. 1063. 82 pp. $0.45.* USDA's only narrative summary of U.S. agriculture as a whole contains selected basic information on agricultural resources, production, finance, marketing, and rural United States.

Urbanization of Land in the Western States. BY HENRY W. DILL, JR., AND ROBERT C. OTTE. *1970. USDA ERS-428. 30 pp., illus.* Great amounts of land were urbanized in the Western United States during 1950-60. More than 71 percent went to dense residential use, 13 percent to open residential use, and smaller percentages to commercial, industrial, recreational, and airport uses. Some 75 percent of the land urbanized had been in cropland and less than 20 percent in pasture and other grassland. Only in the Pacific Northwest were substantial acreages of forest land taken. Very little urbanization came from idle land, cropland generally went directly into urban use.

Conservation Plantings for the Northeast . . . Invite Birds to Your Home. *1969. USDA PA-940. 16 pp. folder. $0.25.* Superseding PA-840, "Conservation Plantings . . . Invite Birds to Your Home," presents in color some of the birds and wildlife food in the Northeast.

Soil surveys

Dickens County, Texas. BY CHARLES L. GIRDNER, JR., AND WAYNE E. RICHARDSON. *1970. 67 pp., illus.; maps 3.17 inches to the mile (1:20,000).*

Lincoln County, Oklahoma. BY GLEN E. WILLIAMS AND DONALD G. BARTOLINA. *1970. 57 pp., illus.; maps 3.17 inches to the mile (1:20,000).*

Tallachatchie County, Mississippi. BY FRANK T. SCOTT, CHARLES D. BOWEN, HARMEL C. WILLIAMS, AND ABRAHAM E. THOMAS. *1970. 59 pp., illus.; maps 4 inches to the mile (1:15,840).*

Runnels County, Texas. BY C. C. WIEDENFELD, L. J. BARNHILL, AND CLIFFORD J. NOVOSAD. *1970. 60 pp., illus.; maps 3.17 inches to the mile (1:20,000).*

Wicomico County, Maryland. BY RICHARD L. HALL. *1970. 90 pp., illus.; maps 4 inches to the mile (1:15,840).* Soils surveyed by C. D. Crocker, C. E. Emery, R. Feuer, R. L. Hall, F. Z. Hutton, Sr., D. C. Leer, and M. R. Nichols.

Greene County, Arkansas. BY NELSE W. ROBERTSON. *1969. 65 pp., illus.; maps 3.17 inches to the mile (1:20,000).*

Lincoln County, Minnesota. BY HILDING L. HOKANSON, WOODROW W. ANDERSON, DONALD W. CALKINS, KEITH W. HEIN, FRANCIS D. LORENZEN, JAMES J. MURRAY, RICHARD O. PAULSON, AND RONAND F. PETERSON. *1970. 84 pp., illus.; maps 4 inches to the mile (1:15,840).*

Recon . . .

A quick overview of the conservation scene

Massachusetts watershed planners received the following favorable comments by U.S. Department of the Interior relative to the West Branch of the Westfield River Watershed Work Plan:

"The work plan is an outstanding example of comprehensive planning for small watershed projects. The plan sets a precedent for the integration of fish and wildlife resource preservation and enhancement and should serve as a model goal for the development of future Public Law 83-566 projects. We commend the watershed planners, project sponsors, Massachusetts Department of Natural Resources, and the Division of Fisheries and Game for this landmark plan for watershed development."

Sediment is No. 1

Silt is still the largest single pollutant of water. In the past third of a century, the silt that has been kept out of streams by the establishment of permanent cover alone would displace a volume of water equal to a 10-year supply for all U.S. households.—SECRETARY OF AGRICULTURE CLIFFORD M. HARDIN, *in his first major speech on conservation and the environment at the National Farm Institute, Des Moines, Iowa.*

Switchgrass and big bluestem are teamed with crownvetch in "Plant Material for Erosion Control in the Northeast" published in November 1969 by Cornell University. Recent studies back up planting recommendations. Much of the work was done at the Big Flats, N.Y., Plant Materials Center. PM Specialist Jesse L. McWilliams is one of the authors.

Laws of ecology

Ecology is the science concerned with: (1) the relation of living things to their environment, and (2) the factors which influence that environment. It is an expression of man's need to realize that he shouldn't try to mold the rest of the natural world to his wishes without adequate understanding of the laws that govern it.

Nature has been at work for a great many millions of years to get things as they are.

Man is a late-comer, and it is probably imperative to his survival to recognize that nature is a total of the conditions and principles which influence the existence of living things. Nature's laws were so contrived that land, water, plants, and animals should, and under natural conditions do, exist in harmony and interdependence for perpetual productiveness.—NORMAN A. BERG, *associate administrator, SCS, to annual meeting of Arkansas Association of Conservation Districts.*

Popular guideline

. . . "Demand for Routine Publications Astonishes Authors" might have headed a release from the Upper Darby, Pa., Regional Technical Service Center this spring. That is, if they had *wanted* more publicity for their "bestseller," *Guidelines for the Control of Erosion and Sediment in Urban Areas of the Northeast.* Of the 1,000 copies printed by the Hyattsville cartographic unit for distribution in March, not one was left to fill April orders. Planning commissions and others outside USDA added to the backlog of requests for the in-Service technical reference. The guide's principles have wide applications even though it is based on the soils and climate of 15 Northeastern States. It covers standards, specifications, and maintenance needs for vegetative and structural measures; resource planning in urban areas; cost-benefit analysis; and soil loss calculations.

Arkansas catfish farming acreage increased more than 80 percent last year, reports State Conservationist Einar Roget. In 1968, the land area used for this relatively new type of inland aquaculture was 5,951 acres; by 1969 the figure had jumped to 10,948 acres.

Michigan's first erosion control law went into effect in April. An ordinance for the city of Ann Arbor (based in large part on standards developed in cooperation with SCS and the Washtenaw County Soil Conservation District) was adopted unanimously by the City Council on March 30, 1970.

Streamflow is not significantly decreased by level terraces, according to results of an Agricultural Research Service project that has been underway in Iowa since 1965. Studies at the Treynor Experimental Watershed show that rainwater reenters streams as ground water instead of directly as runoff. The difference in stream levels below level terraced and unterraced land was less than 1 inch during the first year of observations.

Paying the price

At one time, if it was a choice of saving money or saving trees during construction, it was the trees that went. But public feeling now is such that the financially cheapest way of doing a job may no longer be the most desired way. People are increasingly concerned with their environment; they're questioning old priorities and they appear to be willing to foot the bill to make these changes—RICHARD M. DAILEY, *assistant deputy for watershed (operations), SCS, at the 1970 Watershed Forum, Topeka, Kan., March 1970.*

Temporary erosion control in waterways was best achieved with oat straw pinned down by netting during experiments with artificial liners at Mississippi State University. Agricultural engineers compared the carrying depths of erosion net, jute mesh, stranded fiberglass, excelsior mat, and straw by increasing waterflow until the channel floor or test material failed. All artificial liners helped maintain channels while grass became established, but none matched the long term effectiveness of bermudagrass sod.

From the Administrator:

Good clean water for the future

Our water supply in the United States generally ranges from adequate to abundant. Good quality water, however, is becoming increasingly scarce. In economic terms, clean water is a "scarce good."

We have become accustomed to treating domestic water before using it. On the basis of past trends we can expect the need for treatment to increase for other uses in the future. Whether this is done at its source or at the point of use, Water Bill USA can be expected to go in only one direction—up!

President Nixon in a recent environmental message to Congress discussed the water-pollution problem with particular reference to agricultural sources—animal wastes, eroding soil, fertilizers, and pesticides.

Agriculture has a vital interest in clean water for several reasons. Farmers and other rural residents, as every one else, need clean water to drink. In addition they need good water for their livestock and crop production, and clean streams for fishing and swimming. At the same time, agriculture, as all other segments of our society, contributes to water pollution.

Sediment, a product of erosion, is one of the major water pollutants. Most sediment comes from agricultural lands. Sediment carries other water pollutants, such as organic wastes and inorganic chemicals and infectious agents. Sediment is a costly water pollutant. It adds to the cost of water to farmer and urban dweller alike. It depletes the capacity of lakes and reservoirs. It clogs stream channels and increases flooding.

There is now a growing realization that sediment also comes from construction in urban and suburban areas. Each year, about 1.5 million acres are stripped bare of trees and vegetation for new housing developments, roads, streets, schools, and other construction. While bare, these land areas erode and produce large quantities of sediment. Some studies in Maryland show that land undergoing urban development produces from two to 200 times the amount of sediment as nearby farmland. Without control, nonfarm erosion will increase in the future.

What can be done to reduce this pollution of our waters? Perhaps of first importance is the realization that pollution is mostly a manmade problem and that man will have to solve it. One of Secretary Hardin's objectives is to foster environmental improvement and sustain productivity. This can be done by recognizing and understanding the relationship between soil erosion, land management, and water quality. Reducing water pollutants originating in agriculture and ameliorating the effects on agriculture of those originating from other sources are also important.

A major objective and goal of the Soil Conservation Service in the 1970's is to improve the quality of the environment to provide attractive, convenient, and satisfying living and working conditions for both town and country. Everyone will benefit from clean water, clean air, more wildlife, more attractive landscapes, fewer floods, and convenient recreation opportunities. To achieve this objective we must continue to emphasize the controlling of runoff and sediment delivery from the land in both urban and rural areas. And we must also emphasize the use of land-treatment measures for all watershed lands to improve water quality, to control urban erosion, and to abate all forms of agricultural pollution at their source.

Cleaning up America's polluted waters is a job for everyone—for every citizen, every municipality, every industry, and for government at all levels.

Kenneth E. Grant

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Honey Hollow watershed a historic first

In keeping with the movement all over the country to preserve our environment and historical heritage, a small watershed in Bucks County, Pa., was recently dedicated as a National Historic Landmark and thereby marked for preservation from the threat of nearby urbanization.

Honey Hollow, a five-farm, 500-acre watershed near the heart of a bulging East Coast megalopolis, was set aside as a historic "first" in group land use planning on a watershed basis. It proves that man can touch the land and enrich it for all mankind.

The Landmark citation spells out the reasons for this conservation designation: "The Honey Hollow Watershed Conservation Area was the first small upland watershed in agricultural use and multiple ownership to demonstrate that cooperative action, supported by Federal technical assistance was a practicable method of achieving national goals in soil, water, and wildlife conservation and flood prevention. As such, it served as a prototype for thousands of similar small watersheds throughout the Nation."

The important aspects in this story lie in the words "watershed" and "farmer cooperative action." The farmers simply wanted to farm better, and they did not know how to control the erosion they knew they had on their farms.

Honey Hollow, Bucks County, Pa., is the first small watershed project.

This was back in the thirties during the depression. There were no conservation districts to advise and help. The farmers went to the newly formed Soil Conservation Service and were told they had a watershed problem that could not be solved on single farms. This marked the start of the unique small watershed project.

Farm-by-farm, each individual conservation plan outlined by SCS took shape on the land, and through the years these measures served to make the entire drainage area an outstanding example of community conservation.

Thirty years have brought changes to Honey Hollow. Population has grown; land values increased; and threats of urbanism press on the area.

The watershed, the first of its kind, has historical significance, and today the families in the watershed seek, with the aid of many sponsoring organizations, to place Honey Hollow in the public domain as a conservation and nature education center.—MERVIN S. SKILES AND P. A. WARING, *district conservationist, SCS, chairman, Honey Hollow Watershed Association, Doylestown, Pa.* ♦